

CLAIMS

1. (currently amended) A method for reducing spurious emissions in an amplified signal by applying pre-distortion, whose magnitude is frequency-dependent, to an input signal to generate a pre-distorted signal, such that, when the pre-distorted signal is applied to an amplifier to generate the amplified signal, the pre-distortion reduces the spurious emissions in the amplified signal, wherein the pre-distorted signal is generated by:

(a) generating a first frequency-dependent pre-distortion signal corresponding to a first set of frequency components for the input signal;

(b) generating a second frequency-dependent pre-distortion signal corresponding to a second set of frequency components for the input signal, wherein the first set of frequency components is different from the second set of frequency components; and

(c) combining the first and second frequency-dependent pre-distortion signals to generate the pre-distorted signal, wherein:

the first set of frequency components corresponds to positive-frequency components of the input signal, wherein the positive-frequency components correspond to frequencies that are greater than a center frequency of the input signal; and

the second set of frequency components corresponds to negative-frequency components of the input signal, wherein the negative-frequency components correspond to frequencies that are smaller than the center frequency of the input signal.

2. (previously presented) The method of claim 1, wherein the phase of the pre-distortion is also frequency-dependent.

3. (canceled)

4. (previously presented) The method of claim 1, wherein:

the first frequency-dependent pre-distortion signal is generated by:

(1) generating a first set of one or more waveforms corresponding to a first set of one or more pre-distortion parameters;

(2) differentiating the first set of one or more waveforms with respect to time to generate a first set of one or more differentiated waveforms; and

(3) applying the first set of one or more differentiated waveforms to a positive-frequency operation to generate the first frequency-dependent pre-distortion signal; and

the second frequency-dependent pre-distortion signal is generated by:

10 (1) generating a second set of one or more waveforms corresponding to a second set
11 of one or more pre-distortion parameters;

12 (2) differentiating the second set of one or more waveforms with respect to time to
13 generate a second set of one or more differentiated waveforms; and

14 (3) applying the second set of one or more differentiated waveforms to a negative-
15 frequency operation to generate the second frequency-dependent pre-distortion signal.

1 5-6. (canceled)

1 7. (previously presented) The method of claim 1, further comprising the step of generating
2 a frequency-independent pre-distorted signal from the input signal, wherein the frequency-independent
3 pre-distorted signal and the first and second frequency-dependent pre-distortion signals are combined to
4 generate the pre-distorted signal.

1 8. (previously presented) The method of claim 1, wherein:
2 the input signal is represented in a base-band domain; and
3 the first and second frequency-dependent pre-distortion signals are generated in a digital domain.

1 9. (currently amended) An apparatus for applying pre-distortion to an input signal to
2 generate a pre-distorted signal, such that, when the pre-distorted signal is applied to an amplifier to
3 generate an amplified signal, the pre-distortion reduces spurious emissions in the amplified signal, the
4 apparatus comprising:

5 (a) a first signal processing path adapted to generate a main pre-distortion signal from the
6 input signal;

7 (b) a second signal processing path adapted to generate a first frequency-dependent pre-
8 distortion signal corresponding to a first set of frequency components for the input signal;

9 (c) a third signal processing path adapted to generate a second frequency-dependent pre-
10 distortion signal corresponding to a second set of frequency components for the input signal, wherein
11 frequencies of the first set of frequency components [[is]] are different from frequencies of the second set
12 of frequency components; and

13 (d) a combiner adapted to combine the first and second frequency-dependent pre-distortion
14 signals with the main pre-distortion signal to generate the pre-distorted signal.

1 10. (currently amended) The apparatus of claim 9, wherein:

2 the first set of frequency components corresponds to positive-frequency components of the input
3 signal, wherein the positive-frequency components correspond to frequencies that are greater than a
4 center frequency of the input signal; and

5 the second set of frequency components corresponds to negative-frequency components of the
6 input signal, wherein the negative-frequency components to negative frequencies that are smaller than the
7 center frequency of the input signal.

1 11. (previously presented) The apparatus of claim 10, wherein:

2 the first frequency-dependent pre-distortion signal is generated by:

3 (1) generating a first set of one or more waveforms corresponding to a first set of
4 one or more pre-distortion parameters;

5 (2) differentiating the first set of one or more waveforms with respect to time to
6 generate a first set of one or more differentiated waveforms; and

7 (3) applying the first set of one or more differentiated waveforms to a positive-
8 frequency operation to generate the first frequency-dependent pre-distortion signal; and

9 the second frequency-dependent pre-distortion signal is generated by:

10 (1) generating a second set of one or more waveforms corresponding to a second set
11 of one or more pre-distortion parameters;

12 (2) differentiating the second set of one or more waveforms with respect to time to
13 generate a second set of one or more differentiated waveforms; and

14 (3) applying the second set of one or more differentiated waveforms to a negative-
15 frequency operation to generate the second frequency-dependent pre-distortion signal.

1 12. (previously presented) The apparatus of claim 11, wherein the positive-frequency and
2 negative-frequency operations are implemented using filters.

1 13. (currently amended) The apparatus of claim 9, wherein:

2 the first set of frequency components corresponds to positive-frequency components and
3 negative-frequency components of the input signal; [[and]]

4 the second set of frequency components corresponds to only positive-frequency components or
5 only negative-frequency components of the input signal;

6 the positive-frequency components correspond to frequencies that are greater than a center
7 frequency of the input signal; and

8 the negative-frequency components correspond to frequencies that are smaller than the center
9 frequency of the input signal.

1 14. (previously presented) The apparatus of claim 13, wherein:

2 the first frequency-dependent pre-distortion signal is generated by:

3 (1) generating a first set of one or more waveforms corresponding to a first set of
4 one or more pre-distortion parameters;

5 (2) differentiating the first set of one or more waveforms with respect to time to
6 generate the first frequency-dependent pre-distortion signal; and

7 the second frequency-dependent pre-distortion signal is generated by:

8 (1) generating a second set of one or more waveforms corresponding to a second set
9 of one or more pre-distortion parameters;

10 (2) differentiating the second set of one or more waveforms with respect to time to
11 generate a second set of one or more differentiated waveforms; and

12 (3) applying the second set of one or more differentiated waveforms to a negative-
13 frequency operation or a positive-frequency operation to generate the second frequency-dependent pre-
14 distortion signal.

1 15. (previously presented) The apparatus of claim 14, wherein the positive-frequency
2 operation or the negative-frequency operation is implemented using a filter.

1 16. (previously presented) The apparatus of claim 9, wherein:

2 the input signal is represented in a base-band domain; and

3 the main pre-distortion signal and the first and second frequency-dependent pre-distortion signals
4 are generated in a digital domain.

1 17. (previously presented) The apparatus of claim 9, wherein:

2 the first signal processing path comprises:

3 (1) an index generator adapted to generate index values proportional to envelope
4 power of the input signal;

5 (2) a first look-up table adapted to provide first and second pre-distortion parameters
6 using the index values; and

7 (3) a first multiplier adapted to multiply the input signal by the first and second pre-
8 distortion parameters to generate the main pre-distortion signal;

the second signal processing path comprises:

(1) a second look-up table adapted to provide third and fourth pre-distortion parameters using the index values;

(2) a second multiplier adapted to multiply the input signal by the third and fourth pre-distortion parameters to generate first multiplied signals; and

(3) a first differentiator adapted to differentiate the first multiplied signals with respect to time to generate first differentiated signals; and

the third signal processing path comprises:

(1) a third look-up table adapted to provide fifth and sixth pre-distortion parameters using the index values;

(2) a third multiplier adapted to multiply the input signal by the fifth and sixth pre-distortion parameters to generate second multiplied signals; and

(3) a second differentiator adapted to differentiate the second multiplied signals with respect to time to generate second differentiated signals.

18. (previously presented) The apparatus of claim 17, wherein:

the second signal processing path further comprises a positive-frequency filter adapted to filter the first differentiated signals to generate the first frequency-dependent predistortion signal; and

the third signal processing path further comprises a negative-frequency filter adapted to filter the second differentiated signals to generate the second frequency-dependent predistortion signal.

19. (previously presented) The apparatus of claim 17, wherein:

the first differentiated signals are the first frequency-dependent predistortion signal; and

the third signal processing path further comprises either a positive-frequency filter or a negative-frequency filter adapted to filter the second differentiated signals to generate the second frequency-dependent predistortion signal.

20. (currently amended) A method for reducing spurious emissions in an amplified signal by applying pre-distortion, whose magnitude is frequency-dependent, to an input signal to generate a pre-distorted signal, such that, when the pre-distorted signal is applied to an amplifier to generate the amplified signal, the pre-distortion reduces the spurious emissions in the amplified signal, wherein the pre-distorted signal is generated by:

(a) generating a first frequency-dependent pre-distortion signal corresponding to a first set of frequency components for the input signal;

8 (b) generating a second frequency-dependent pre-distortion signal corresponding to a second
9 set of frequency components for the input signal, wherein the first set of frequency components is
10 different from the second set of frequency components; and

11 (c) combining the first and second frequency-dependent pre-distortion signals to generate
12 the pre-distorted signal, wherein:

13 the first set of frequency components corresponds to positive-frequency components and
14 negative-frequency components of the input signal; [[and]]

15 the second set of frequency components corresponds to only positive-frequency
16 components or only negative-frequency components of the input signal;

17 the positive-frequency components correspond to frequencies that are greater than a
18 center frequency of the input signal; and

19 the negative-frequency components correspond to frequencies that are smaller than the
20 center frequency of the input signal.

1 21. (previously presented) The method of claim 20, wherein the phase of the pre-distortion
2 is also frequency-dependent.

1 22. (previously presented) The method of claim 20, wherein:

2 the first frequency-dependent pre-distortion signal is generated by:

3 (1) generating a first set of one or more waveforms corresponding to a first set of
4 one or more pre-distortion parameters;

5 (2) differentiating the first set of one or more waveforms with respect to time to
6 generate the first frequency-dependent pre-distortion signal; and

7 the second frequency-dependent pre-distortion signal is generated by:

8 (1) generating a second set of one or more waveforms corresponding to a second set
9 of one or more pre-distortion parameters;

10 (2) differentiating the second set of one or more waveforms with respect to time to
11 generate a second set of one or more differentiated waveforms; and

12 (3) applying the second set of one or more differentiated waveforms to a negative-
13 frequency operation or a positive-frequency operation to generate the second frequency-dependent pre-
14 distortion signal.

1 23. (previously presented) The method of claim 20, further comprising the step of
2 generating a frequency-independent pre-distorted signal from the input signal, wherein the frequency-

3 independent pre-distorted signal and the first and second frequency-dependent pre-distortion signals are
4 combined to generate the pre-distorted signal.

1 24. (previously presented) The method of claim 20, wherein:
2 the input signal is represented in a base-band domain; and
3 the first and second frequency-dependent pre-distortion signals are generated in a digital domain.